

Pending Claims Following February 2003 Amendment

1. An organic polymer having a plurality of regions along the length of the

polymer backbone and comprising two or more of the following:

- (i) a first region for transporting negative charge carriers and having a

bandgap defined by a first LUMO level and a first HOMO level; and

(ii) a second region for transporting positive charge carriers and having a second bandgap defined by a second LUMO level and a second HOMO level; and

(iii) a third region for accepting and combining positive and negative charge carriers to generate light and having a third bandgap defined by a third LUMO level and a third HOMO level,

wherein each region comprises one or more monomers and the quantity and arrangement of the monomers in the organic polymer is selected so that the first, second and third bandgaps are distinct from one another in the polymer, and wherein there is no cross-linking functionality on the polymer.

2. An organic polymer according to claim 1, wherein the first region comprises a first monomer comprising a substituted or unsubstituted aromatic or heteroaromatic group.

3. An organic polymer according to claim 2, wherein the first monomer comprises a substituted or unsubstituted fluorene group.

4. An organic polymer according to claim 3, wherein the first monomer comprises a 2,7-linked dialkyl fluorene group.

5. An organic polymer according to claim 4, wherein the 2,7linked dialkyl fluorene group is a 9,9 dioctyl fluorene group.

RECEIVED

MAR 07 2003

GROUP 1700

6. An organic polymer according to claim 1, wherein the second region comprises a second monomer comprising a substituted or unsubstituted aromatic or heteroaromatic group.

7. An organic polymer according to claim 6, wherein the second monomer comprises a triarylamine unit having the general formula $\{\text{Ar}_3\text{N}\}$ wherein each Ar is the same or different and comprises a substituted or unsubstituted aromatic or heteroaromatic group.

8. An organic polymer according to claim 6, wherein at least one Ar comprises a substituted or unsubstituted phenyl group.

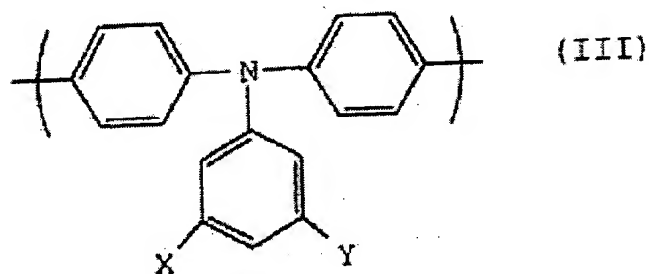
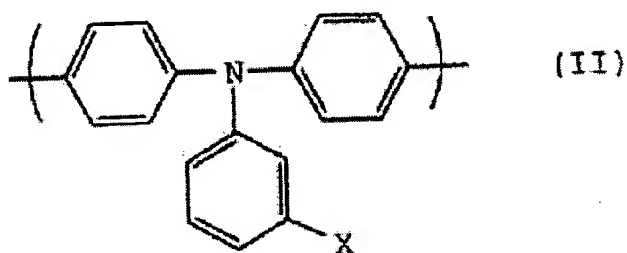
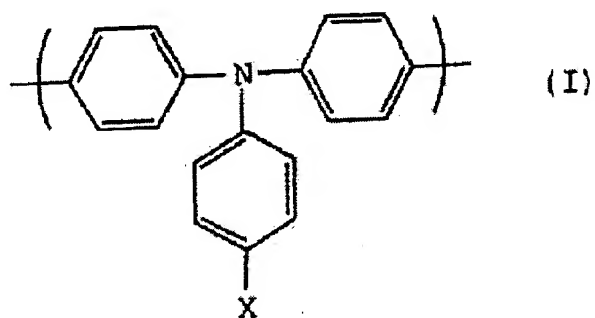
9. An organic polymer according to claim 7, wherein at least one Ar comprises a substituted or unsubstituted aromatic or heteroaromatic side group that is pendent to the polymer backbone.

10. An organic polymer according to claim 9, wherein the side group comprises a substituted or unsubstituted aryl group.

11. An organic polymer according to claim 10, wherein the side group comprises an unsubstituted phenyl or a monosubstituted or 3,5-disubstituted phenyl group.

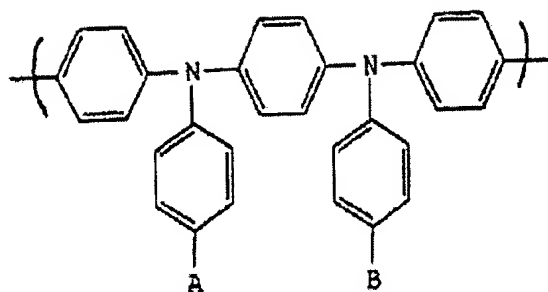
12. An organic polymer according to claim 9, wherein the side group has a substituent group comprising a substituted or unsubstituted alkyl, perfluoroalkyl, alkylaryl, arylalkyl, heteroaryl, aryl, alkoxy, thioalkyl or cyano group.

13. An organic polymer according to claim 7, wherein the triarylamine unit comprises a group having a formula as shown in any one of Formulas I, II, or III.

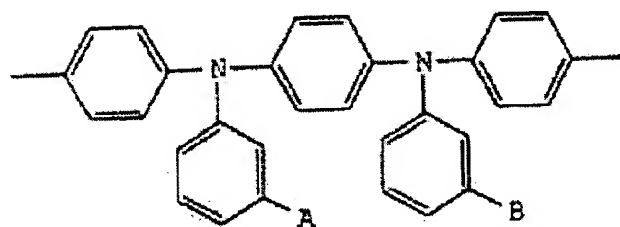


where X and Y are the same or different and are substituent groups.

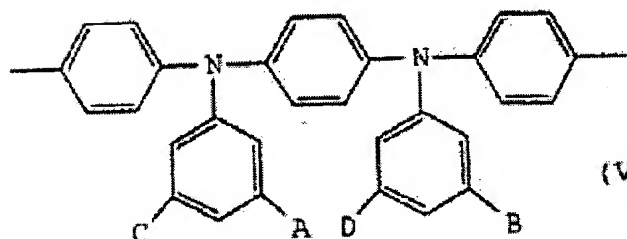
14. An organic polymer according to claim 13, wherein the triarylamine unit comprises a group having a formula as shown in any one of Formulas IV, V or VI:



(IV)



(V)



(VI)

wherein A, B, C and D are the same or different and are substituent groups.

15. An organic polymer according to claim 13, wherein one or more of X, Y, A, B, C and D is independently selected from the group consisting of hydrogen, alkyl, aryl, perfluoroalkyl, thioalkyl, cyano, alkoxy, heteroaryl, alkylaryl, and arylalkyl groups.

16. An organic polymer according to claim 15, wherein one or more of X, Y, A, B, C and D is independently selected from the group consisting of an unsubstituted, isobutyl group, an n-alkyl, an n-alkoxy or a trifluoromethyl group.

17. An organic polymer according to claim 15, wherein X and Y or A, B, C and D are the same.

18. An organic polymer according to claim 1, wherein the third region comprises a third monomer comprising a substituted or unsubstituted aromatic or heteroaromatic group.

19. An organic polymer according to claim 18, wherein the third monomer comprises a group H which is an aromatic or heteroaromatic diazine group fused to a benzene or thiophene group.

20. An organic polymer according to claim 19, wherein the third monomer comprises a group having a formula as shown in Formula IX:



wherein Ar₁ is a substituted or unsubstituted aromatic or heteroaromatic group.

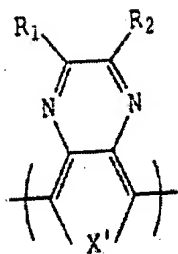
21. An organic polymer according to claim 20, wherein the third monomer comprises a group having a formula as shown in Formula X:



heteroaromatic group and Ar₁ is as defined in claim 20.

22. An organic polymer according to claim 20, wherein Ar₁ or Ar₂ independently comprises a substituted or unsubstituted, fused or unfused benzene, thiophene, furan, quinoxaline, biphenyl or fluorene group.

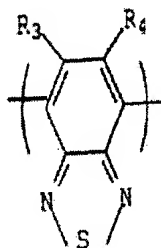
23. An organic polymer according to claim 19 wherein the third monomer comprises a group having a formula as shown in Formula VIII:



(VIII)

wherein X' is RC=CR or S and R₁ and R₂ are the same or different and are each a substituent group.

24. An organic polymer according to claim 19, wherein the third monomer comprises a group having a formula as shown in Formula XI:



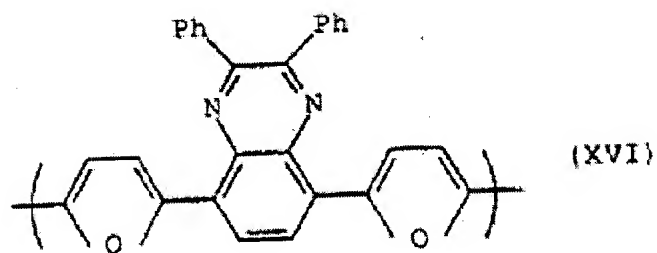
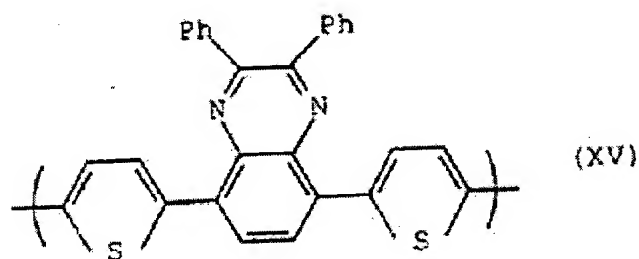
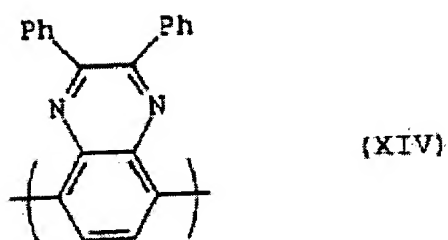
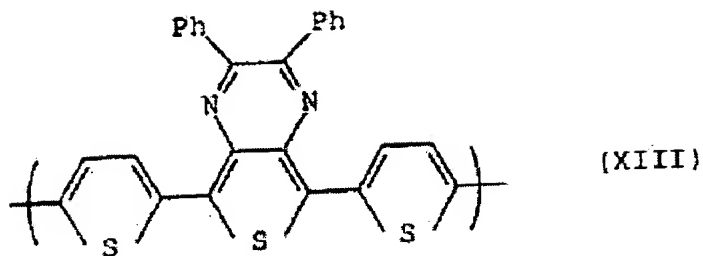
(XI)

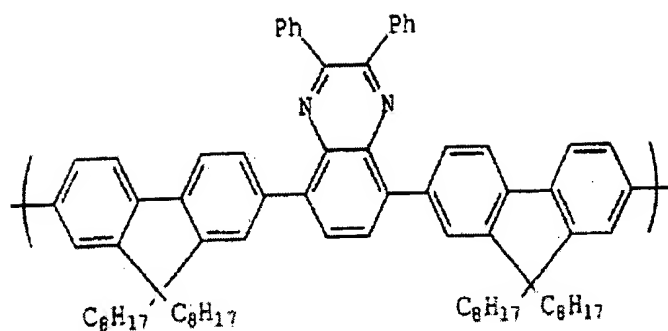
wherein R₃ and R₄ are the same or different and are each independently a substituent group.

25. An organic polymer according to claim 23, wherein one or more of R₁, R₂, R₃ and R₄ is each independently selected from hydrogen, alkyl, aryl, perfluoroalkyl, thioalkyl, cyano, alkoxy, heteroaryl, alkylaryl, arylalkyl, pyridine or furan.

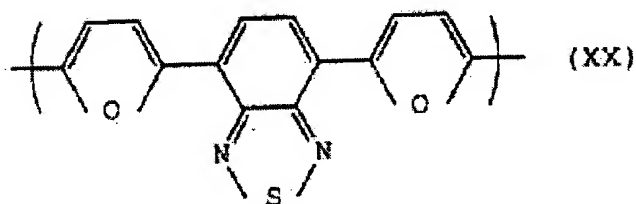
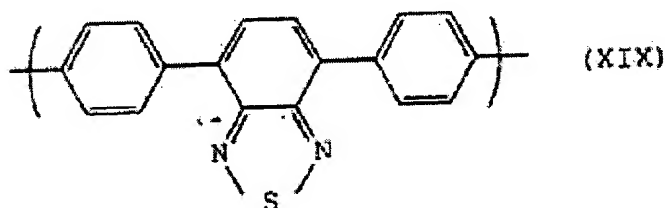
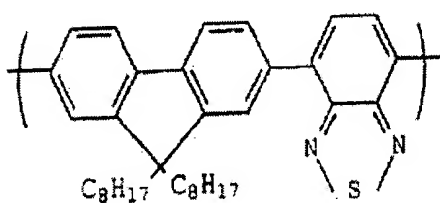
26. An organic polymer according to claim 25, wherein R₁ and R₂ or R₃ and R₄ are the same and are each a phenyl group.

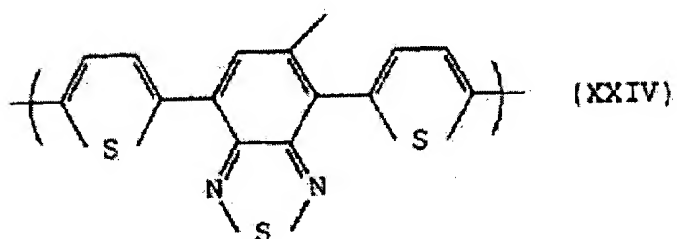
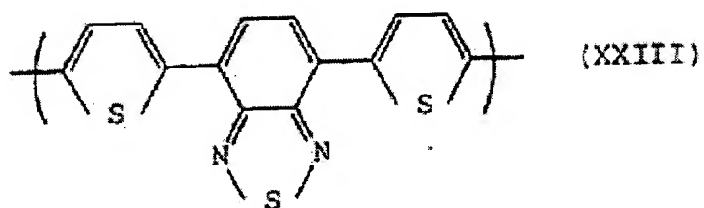
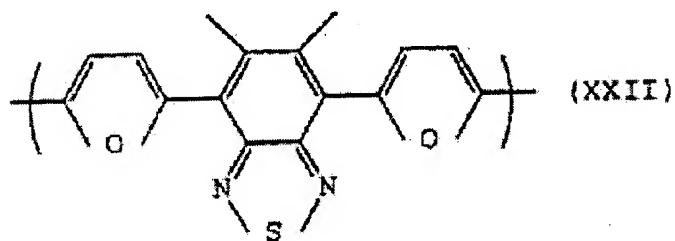
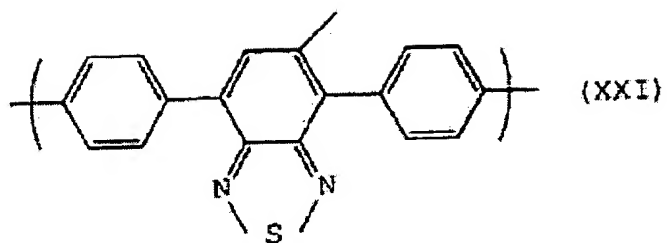
27. An organic polymer according to claim 23, wherein the third monomer comprises a group having a formula as shown in any one of Formulas XIII to XVII:

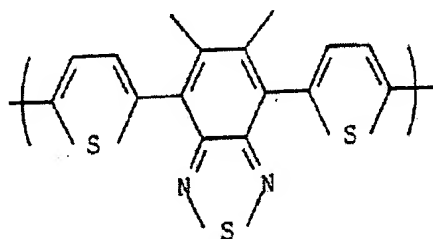




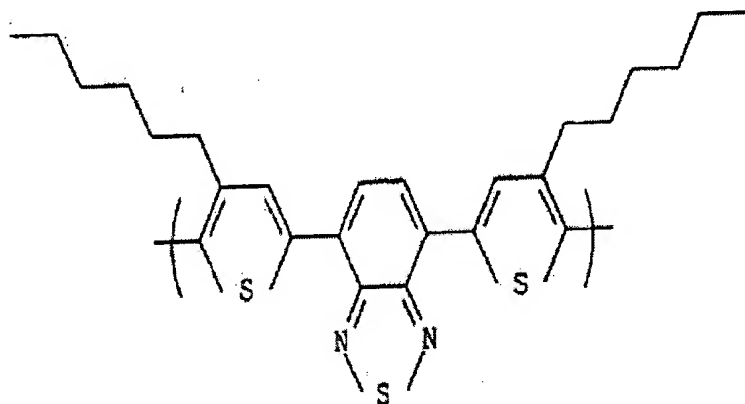
28. An organic polymer according to claim 23, wherein the third monomer comprises a group having a formula as shown in any one of Formulas XVIII to XXVI:







(XXV)



(XXVI)

29. An organic polymer according to claim 18, wherein the third monomer comprises a triarylamine unit.

30. An organic polymer according to claim 29, wherein the third monomer comprises a group having the formula $\{(-\text{Ar}_2\text{N-})-\text{Ar-}(-\text{NAr}_2-)\}_n$, wherein each Ar is the same or different and comprises a substituted or unsubstituted aromatic or heteroaromatic group.

31. An organic polymer according to claim 30, wherein at least one Ar comprises a substituted or unsubstituted aryl group.

32. An organic polymer according to claim 31, wherein the at least one Ar comprises an unsubstituted phenyl group.

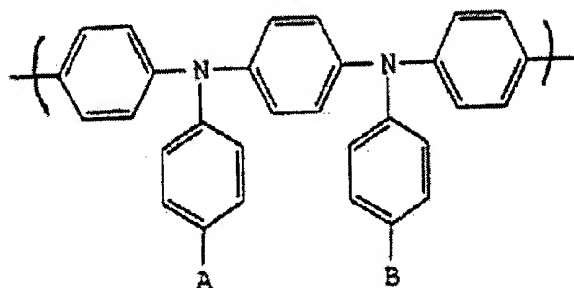
33. An organic polymer according to claim 30, wherein at least one Ar comprises a substituted or unsubstituted aromatic or heteroaromatic side group that is pendent to the polymer backbone.

34. An organic polymer according to claim 33, wherein the side group comprises fused or unfused benzene, thiophene, furan, quinoxaline, biphenyl or fluorene group.

35. An organic polymer according to claim 34, wherein the side group comprises a monosubstituted phenyl group.

36. An organic polymer according to claim 33, wherein the side group has a substituent group comprising hydrogen or a substituted or unsubstituted alkyl, perfluoroalkyl, alkylaryl, arylalkyl, heteroaryl, aryl, alkoxy, thioalkyl or cyano group.

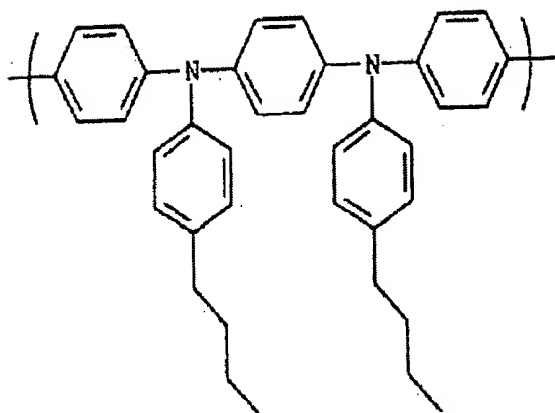
37. An organic polymer according to claim 35, wherein the triarylamine unit comprises a group having a formula as shown in Formula IV



(IV)

wherein A and B are the same or different and are substituent groups.

38. An organic polymer according to claim 37, wherein the third monomer comprises a group having a formula as shown in Formula XXVII:



(XXVII)

39. An organic polymer according to claim 1, wherein the first region additionally comprises a fourth monomer comprising a further substituted or unsubstituted aromatic or heteroaromatic group.

40. An organic polymer according to claim 39 wherein the further substituted or unsubstituted aromatic or heteroaromatic group comprises a group as shown in formula XI wherein R₃ and R₄ are both hydrogen.

41. An organic polymer according to claim 6, wherein the second region additionally comprises a fifth monomer comprising a further second monomer as defined in claim 6, which is different from the second monomer.

42. An organic polymer having a plurality of regions along the length of the polymer backbone and comprising all three of the following:

(i) a first region for transporting negative charge carriers and having a first bandgap defined by a first LUMO level and

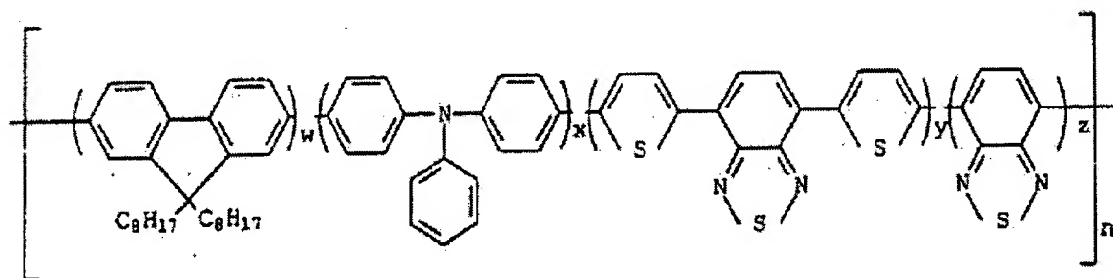
(ii) a second region for transporting positive charge carriers and having a second bandgap defined by a second LUMO level and a second HOMO level; and

(iii) a third region for accepting and combining positive and negative charge carriers to generate light and having a third bandgap defined by a third LUMO level and a third HOMO level,

wherein each region comprises one or more monomers and the quantity and arrangement of the monomers in the organic polymer is selected so that the first, second and third bandgaps are distinct from one another in the polymer.

43. An organic polymer according to claim 42, wherein the third region is in a layer between the anode and the cathode and when a voltage is applied emits light with a wavelength in the range 600 nm to 700 nm.

44. An organic polymer according to claim 42, having a formula as shown in Formula XXVIII:

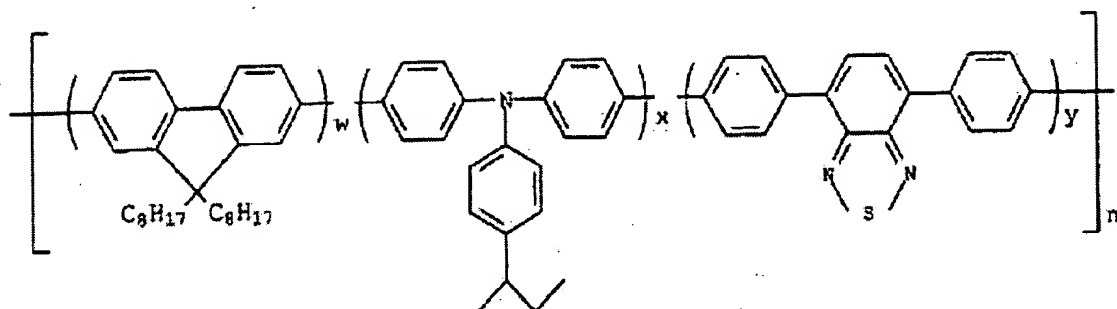


XXVIII

wherein $w + x + y + z = 1$, $w \geq 0.5$, $0 \leq x + y + z \leq 0.5$ and $n \geq z$.

45. An organic polymer according to claim 42, wherein the third light having a wavelength in the range 500 nm to 600 nm

46. An organic polymer according to claim 42, having a formula as shown in Formula XXIX:

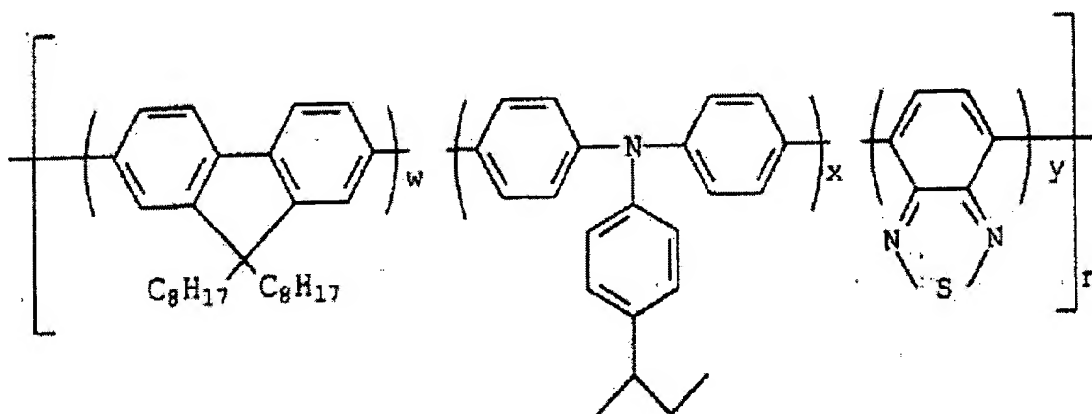


(XXIX)

wherein $w + x + y = 1$, $w \geq 0.5$, $0 \leq x + y \leq 0.5$ and $n \geq 2$.

47. An organic polymer according to claim 42, having a formula as shown in

Formula XXX:

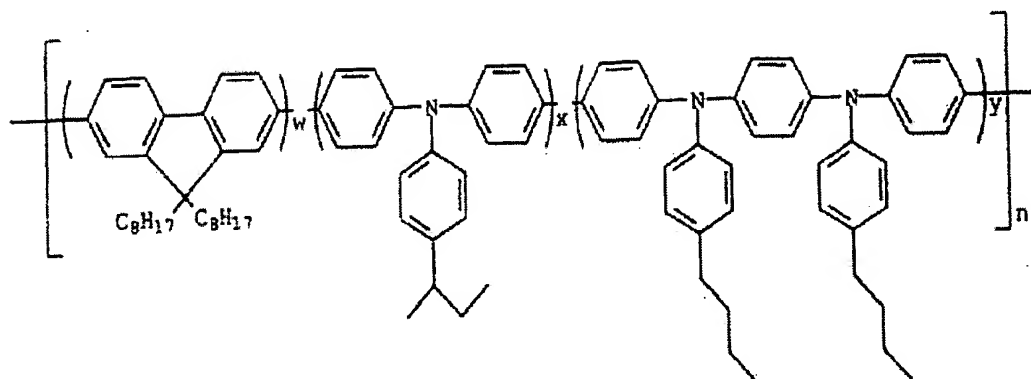


(XXX)

wherein $w + x + y = 1$, $w \geq 0.5$, $0 \leq x + y \leq 0.5$ and $n \geq 2$.

48. An organic polymer according to claim 42, wherein the third monomer is in a layer between the anode and the cathode and when a voltage is applied emits light having a wavelength in the range of 400 nm to 500 nm.

49. An organic polymer according to claim 51, having a formula as shown in Formula XXXI:



(XXXI)

wherein $w + x + y = 1$, $w \geq 0.5$, $0 \leq x + y \leq 0.5$ and $n \geq 2$.

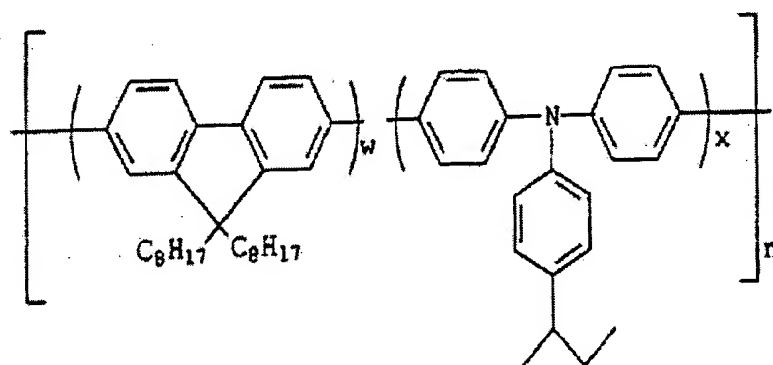
50. An organic polymer according to claim, comprising:

(i) a first region for transporting negative charge carriers and having a first bandgap defined by a first LUMO level and a first HOMO level; and

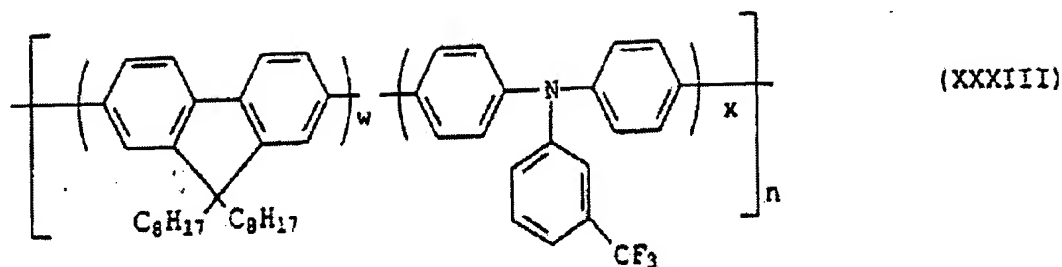
(ii) a second region for transporting positive charge carriers and having a second bandgap defined by a second LUMO level and a second HOMO level;

and wherein each region comprises one or more monomers and the quantity and arrangement of the monomers within the organic polymer is selected so that the first and second bandgaps are distinct from one another in the polymer.

51. An organic polymer according to claim 50, having a formula as shown in Formula XXXII or XXXIII:



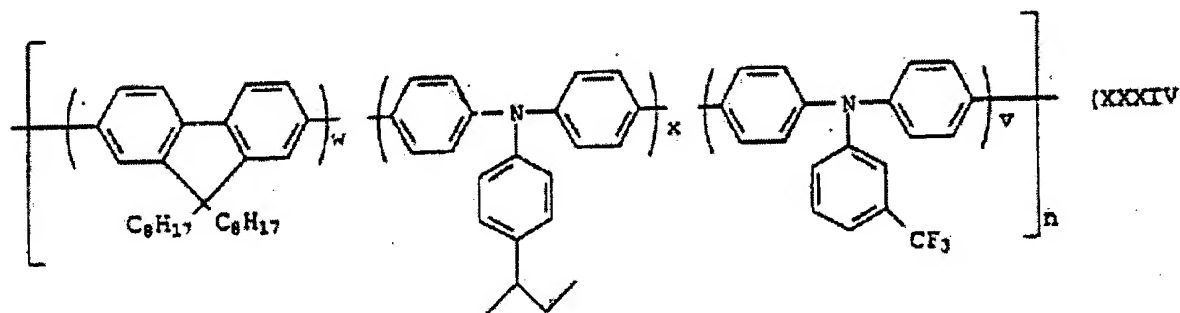
(XXXII)



wherein $w + x = 1$, $w \geq 0.5$, $x \leq 0.5$ and $n \geq 2$.

52. An organic polymer according to claim 50, having a formula as shown in

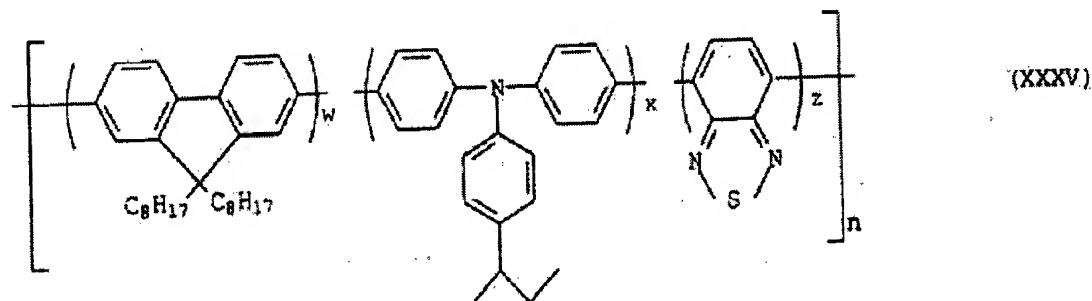
Formula XXXIV:



wherein $w + x + v = 1$, $w \geq 0.5$, $0 \leq x + v \leq 0.5$ and $n \geq 2$.

53. An organic polymer according to claim 50, having a formula as shown in

Formula XXXV:



wherein $w + x + z = 1$, $w \geq 0.5$, $0 \leq x + z \leq 0.5$ and $n \geq 2$.

54. An organic polymer according to claim 50, which is blended with a light emissive material.

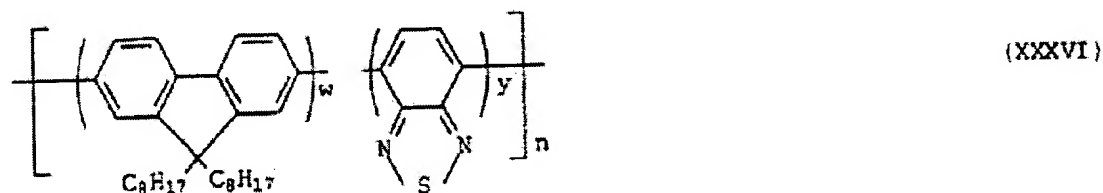
55. An organic polymer according to claim 1, comprising:

(i) a first region for transporting negative charge carriers and having a first bandgap defined by a first LUMO level and a first HOMO level: and

(ii) a third region for accepting and combining positive and negative charge carriers to generate light and having a third bandgap defined by a third LUMO level and a third HOMO level,

wherein each region comprises one or more monomers and the quantity and arrangement of the monomers in the organic polymer is selected so that the first and third bandgaps are distinct from one another in the polymer.

56. An organic polymer according to claim 55, having a formula as shown in Formula XXXVI



wherein $w + y = 1$, $w \geq 0.5$ and $y \leq 0.5$ and $n \geq 2$.

57. An organic polymer according to claim 55, which is blended with a hole transporting material.

58. An organic polymer according to claim 57, wherein the hole transporting material comprises a poly-triarylamine.

59. An organic polymer according to claim 1, comprising:

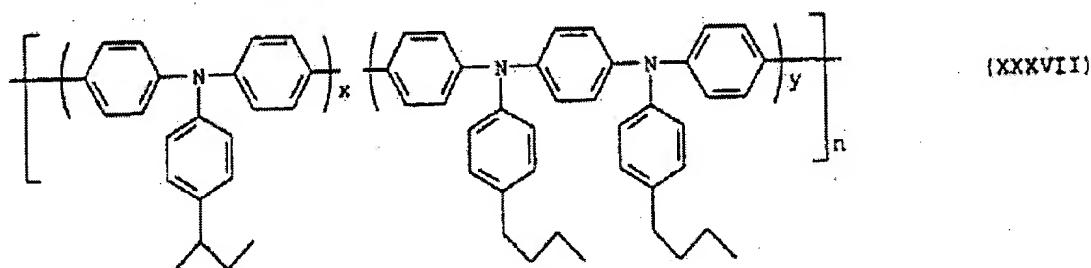
(i) a second region for transporting positive charge carriers and having a

second bandgap defined by a second LUMO level and a second HOMO level; and

(ii) a third region for accepting and combining positive and negative charge carriers to generate light and having a third bandgap defined by a third LUMO level and a third HOMO level,

wherein each region comprises one or more monomers and the quantity and arrangement of the monomers in the organic polymer is selected so that the second and third bandgaps are distinct from one another in the polymer.

60. An organic polymer according to claim 59, having a formula as shown in Formula XXXVII:



wherein $x + y = 1$, $x \geq 0.5$ and $y \leq 0.5$ and $n \geq 2$.

61. An organic polymer according to claim 59 which is blended with an electron transporting material.

62. An organic polymer according to claim 61, wherein the electron transporting material comprises poly-fluorene.

63. An optical device including a polymer according to claim 1.

64. The optical device according to claim 63, wherein the optical device comprises an electroluminescent device.

65. An electroluminescent device comprising an anode layer, a cathode layer and a layer of a polymer according to claim 1 situated between the anode layer and the cathode layer.

66. An organic polymer having a plurality of regions along the length of the polymer backbone and comprising two or more of the following:

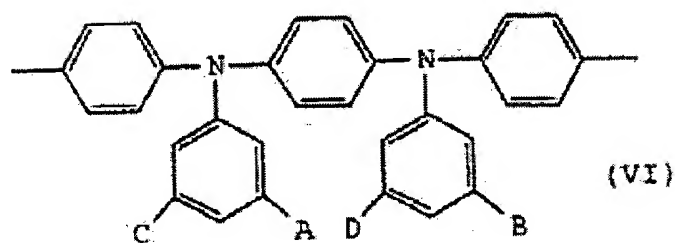
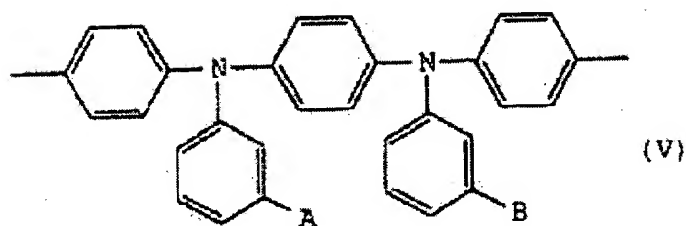
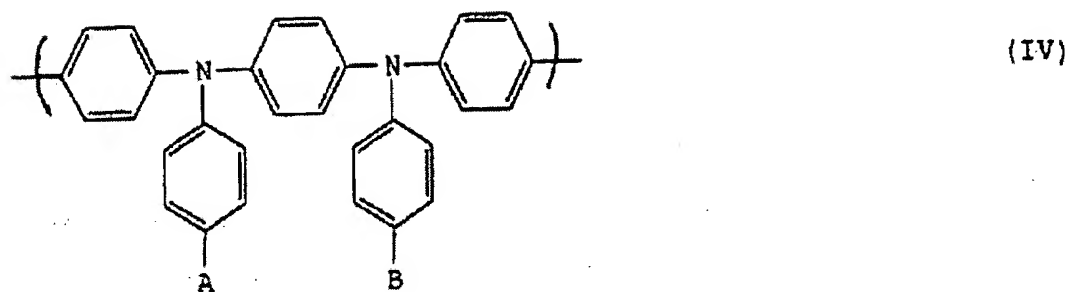
- (i) a first region for transporting negative charge carriers and having a first bandgap defined by a first LUMO level and a first HOMO level; and
- (ii) a second region for transporting positive charge carriers and having a second bandgap defined by a second LUMO level and a second HOMO level; and
- (iii) a third region for accepting and combining positive and negative charge carriers to generate light and having a third bandgap defined by a third LUMO level and a third HOMO level,

wherein each region comprises one or more monomers and the quantity and arrangement of the monomers in the organic polymer is selected so that the first, second and third bandgaps are distinct from one another in the polymer, and wherein the first region comprises a first monomer comprising a substituted or unsubstituted fluorene group.

67. An organic polymer according to claim 66, wherein the first monomer comprises a 2,7-linked dialkyl fluorene group.

68. An organic polymer according to claim 67, wherein the 2,7-linked dialkyl fluorene group is a 9,9 dioctyl fluorene group.

69. An organic polymer according to claim 66, wherein the second region comprises a second monomer comprising a substituted or unsubstituted aromatic or heteroaromatic group.
70. An organic polymer according to claim 69, wherein the second monomer comprises a triarylamine unit having the general formula $\text{-(Ar}_3\text{N)-}$ wherein each Ar is the same or different and comprises a substituted or unsubstituted aromatic or heteroaromatic group.
71. An organic polymer according to claim 69, wherein at least one Ar comprises a substituted or unsubstituted phenyl group.
72. An organic polymer according to claim 70, wherein at least one Ar comprises a substituted or unsubstituted aromatic or heteroaromatic side group that is pendent to the polymer backbone.
73. An organic polymer according to claim 72, wherein the side group comprises a substituted or unsubstituted aryl group.
74. An organic polymer according to claim 73, wherein the side group comprises an unsubstituted phenyl or a monosubstituted or 3,5-disubstituted phenyl group.
75. An organic polymer according to claim 72 wherein the side group has a substituent group comprising a substituted or unsubstituted alkyl, perfluoroalkyl, alkylaryl, arylalkyl, heteroaryl, aryl, alkoxy, thioalkyl or cyano group.
76. An organic polymer according to claim 75, wherein the triarylamine unit comprises a group having a formula as shown in any one of Formulas IV, V or VI:



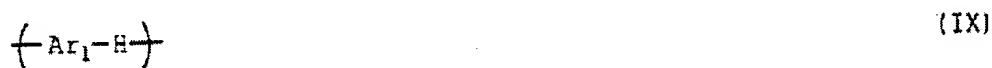
77. An organic polymer according to claim 75, wherein one or more of X, Y, A, B, C and D is independently selected from the group consisting of hydrogen, alkyl, aryl, perfluoroalkyl, thioalkyl, cyano, alkoxy, heteroaryl, alkylaryl, and arylalkyl groups.

78. An organic polymer according to claim 77, wherein one or more of X, Y, A, B, C and D is independently selected from the group consisting of an unsubstituted, isobutyl group, an n-alkyl, an n-alkoxy or a trifluoromethyl group.

79. An organic polymer according to claim 77, wherein X and Y or A, B, C and D are the same.

80. An organic polymer according to claim 1, wherein the third region comprises a third monomer comprising a group H which is an aromatic or heteroaromatic diazine group fused to a benzene or thiophene group.

81. An organic polymer according to claim 80, wherein the third monomer comprises a group having a formula as shown in Formula IX:



wherein Ar₁ is a substituted or unsubstituted aromatic or heteroaromatic group.

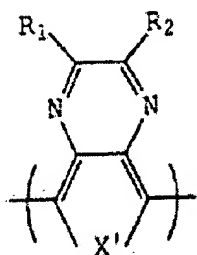
82. An organic polymer according to claim 81, wherein the third monomer comprises a group having a formula as shown in Formula X:



wherein Ar₂ is a substituted aromatic or heteroaromatic group and Ar₁ is as defined in claim 20.

83. An organic polymer according to claim 81, wherein Ar₁ or Ar₂ independently comprises a substituted or unsubstituted, fused or unfused benzene, thiophene, furan, quinoxaline, biphenyl or fluorene group.

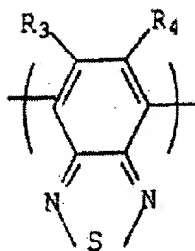
84. An organic polymer according to claim 80, wherein the third monomer comprises a group having a formula as shown in Formula VIII:



(VIII)

wherein X' is $RC=CR$ or S and R_1 and R_2 are the same or different and are each a substituent group.

85. An organic polymer according to claim 80 wherein the third monomer comprises a group having a formula as shown in Formula XI:



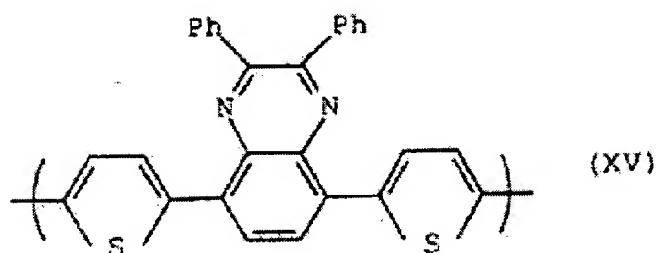
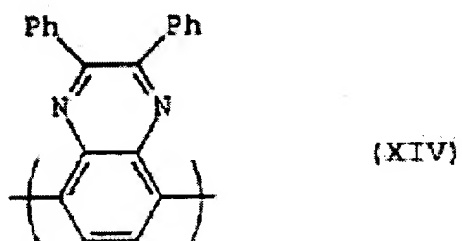
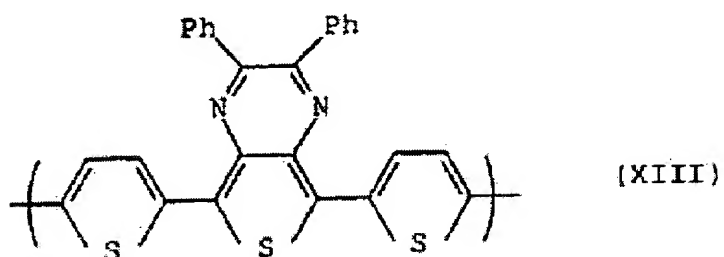
(XI)

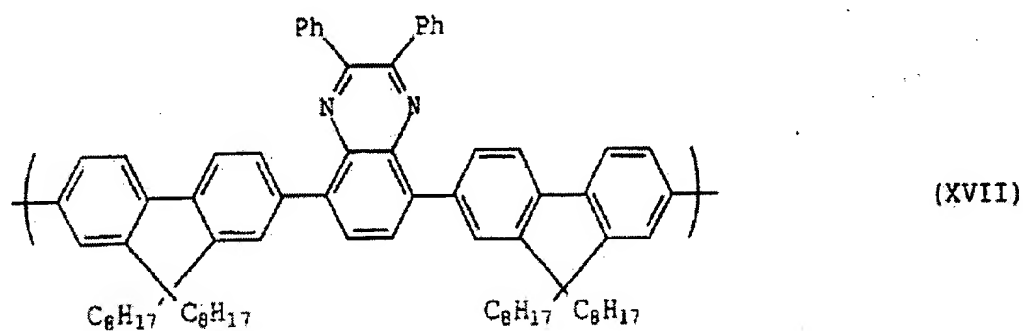
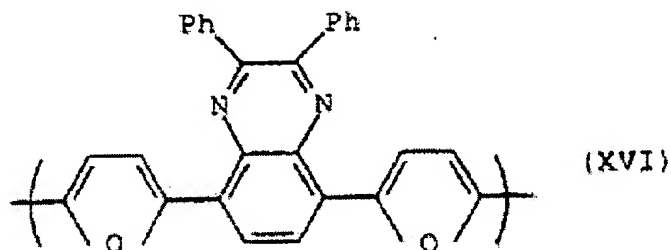
wherein R_3 and R_4 are the same or different and are each independently a substituent group.

86. An organic polymer according to claim 84, wherein one or more of R_1 , R_2 , R_3 , and R_4 is each independently selected from hydrogen, alkyl, aryl, perfluoroalkyl, thioalkyl, cyano, alkoxy, heteroaryl, alkylaryl, arylalkyl, pyridine or furan.

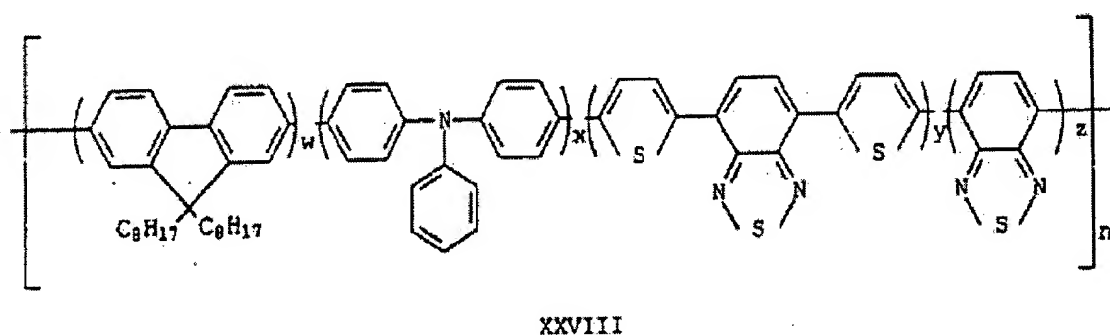
87. An organic polymer according to claim 86, wherein R_1 and R_2 or R_3 and R_4 are the same and are each a phenyl group.

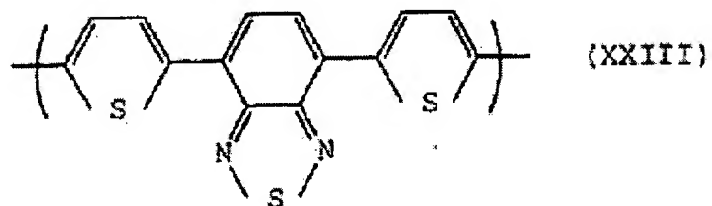
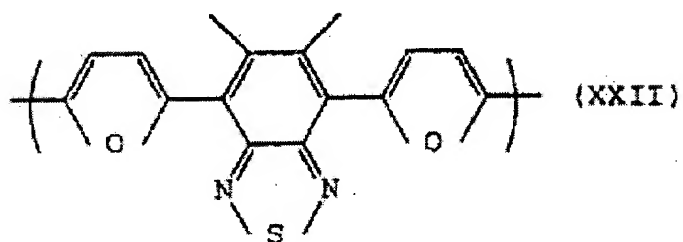
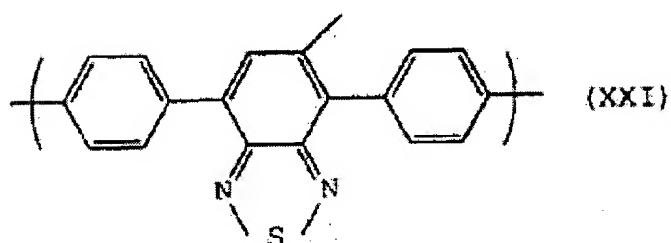
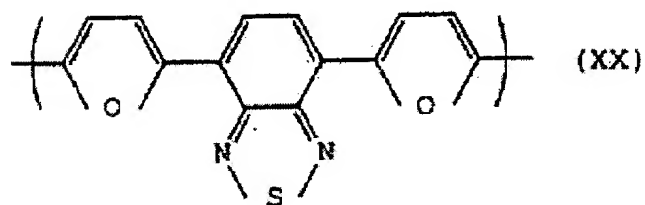
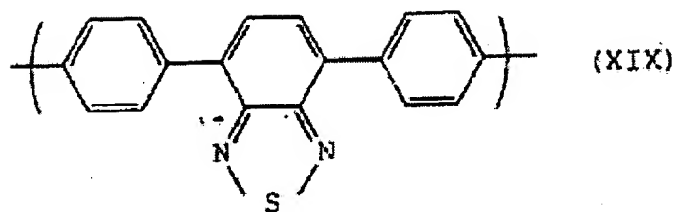
88. An organic polymer according to any one of claim 84, wherein the third monomer comprises a group having a formula as shown in any one of Formulas XIII to XVII:

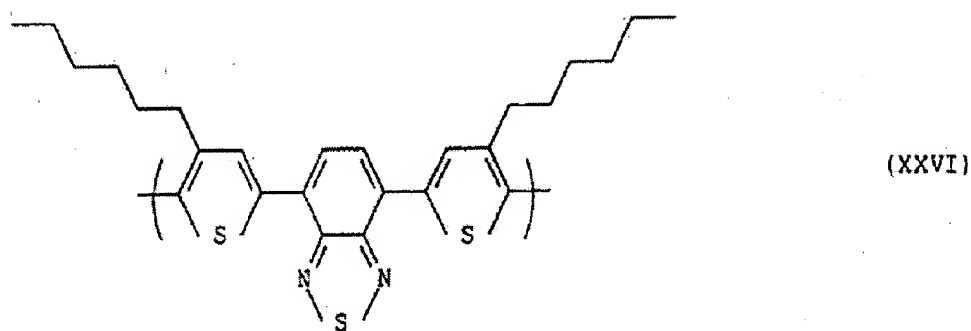
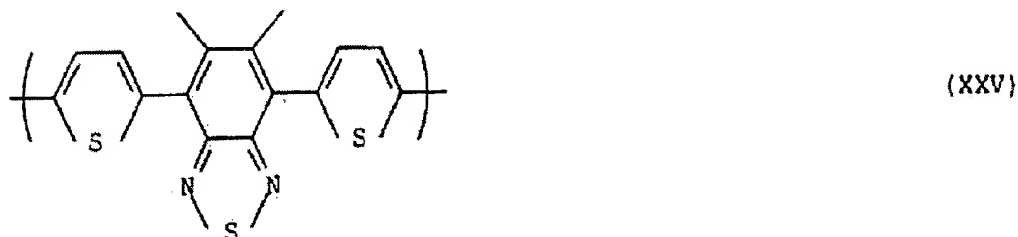
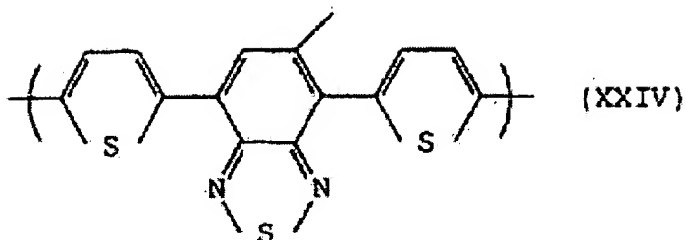




89. An organic polymer according to claim 84, wherein the third monomer comprises a group having a formula as shown in any one of Formulas XVIII to XXVI:







90. An organic polymer having a plurality of regions along the length of the polymer backbone and comprising two or more of the following:

- (i) a first region for transporting negative charge carriers and having a first bandgap defined by a first LUMO level and a first HOMO level; and
- (ii) a second region for transporting positive charge carriers and having a second bandgap defined by a second LUMO level and a second HOMO level; and
- and
- (iii) a third region for accepting and combining positive and negative charge carriers to generate light and having a third bandgap defined by a third

LUMO level and a third HOMO level, wherein each region comprises one or more monomers and the quantity and arrangement of the monomers in the organic polymer is selected so that the first, second and third bandgaps are distinct from one another in the polymer, wherein the third region comprises a third monomer comprising a triarylamine unit.

91. An organic polymer according to claim 90, wherein the third monomer comprises a group having the formula $[(-Ar_2N-) -Ar-(-NAr_2-)]$, wherein each Ar is the same or different and comprises a substituted or unsubstituted aromatic or heteroaromatic group.

92. An organic polymer according to claim 91, wherein at least one Ar comprises a substituted or unsubstituted aryl group.

93. An organic polymer according to claim 92, wherein the at least one Ar comprises an unsubstituted phenyl group.

94. An organic polymer according to any one of claim 91, wherein at least one Ar comprises a substituted or unsubstituted aromatic or heteroaromatic side group that is pendent to the polymer backbone.

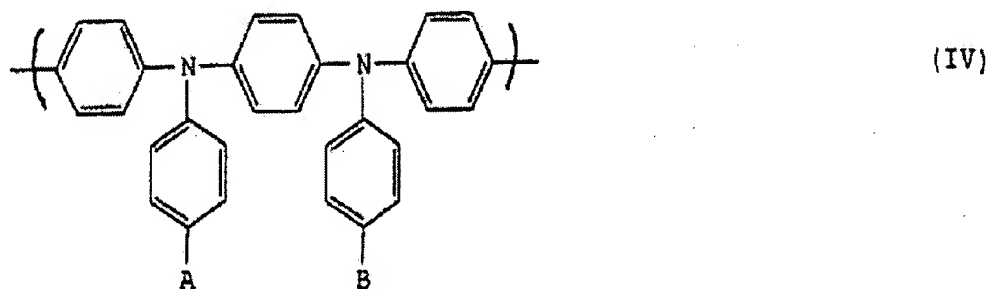
95. An organic polymer according to claim 94, wherein the side group comprises fused or unfused benzene, thiophene, furan, quinoxaline, biphenyl or fluorene group.

96. An organic polymer according to claim 95, wherein the side group comprises a monosubstituted phenyl group.

97. An organic polymer according to claim 94, wherein the side group has a substituent group comprising hydrogen or a substituted or unsubstituted alkyl,

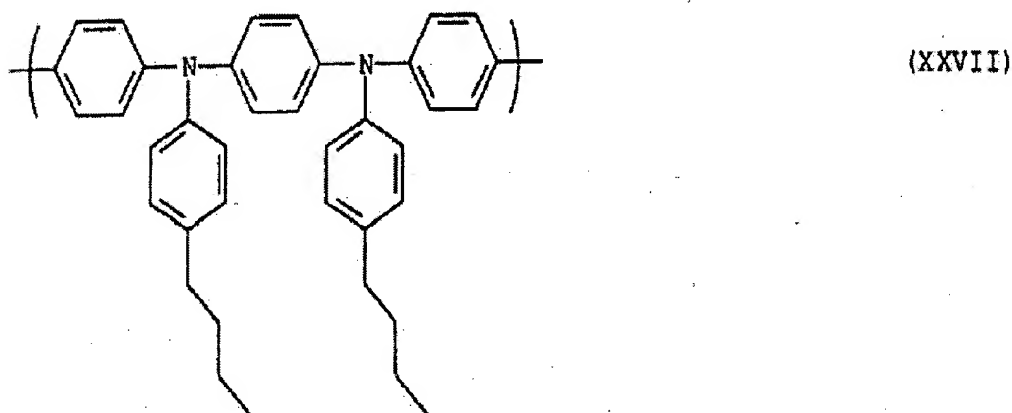
perfluoroalkyl, alkylaryl, arylalkyl, heteroaryl, aryl, alkoxy, thioalkyl or cyano group.

98. An organic polymer according to claim 97, wherein the triarylamine unit comprises a group having a formula as shown in Formula IV



wherein A and B are the same or different and are substituent groups.

99. An organic polymer according to claim 98, wherein the third monomer comprises a group having a formula as shown in Formula XXVII:



100. An organic polymer having a plurality of regions along the length of the polymer backbone and comprising two or more of the following:

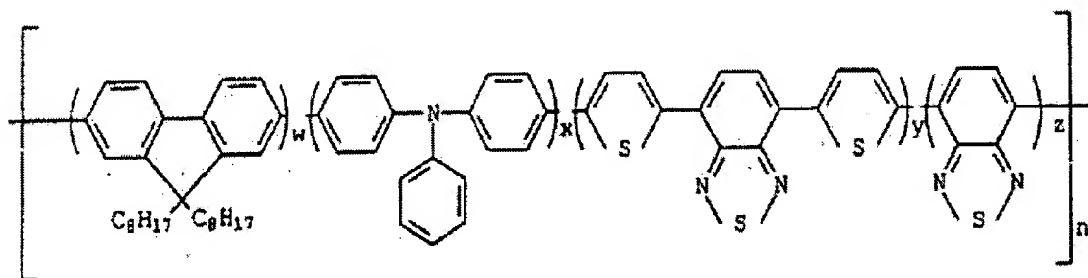
- (i) a first region for transporting negative charge carriers and having a first bandgap defined by a first LUMO level and a first HOMO level; and

(ii) a second region for transporting positive charge carriers and having a second bandgap defined by a second LUMO level and a second HOMO level; and

(iii) a third region for accepting and combining positive and negative charge carriers to generate light and having a third bandgap defined by a third LUMO level and a third HOMO level, wherein each region comprises one or more monomers and the quantity and arrangement of the monomers in the organic polymer is selected so that the first, second and third bandgaps are distinct from one another in the polymer, wherein the first region additionally comprises a fourth monomer comprising a further substituted or unsubstituted aromatic or heteroaromatic group.

101. An organic polymer according to claim 100 wherein the further substituted or unsubstituted aromatic or heteroaromatic group comprises a group as shown in formula XI wherein R_3 and R_4 are both hydrogen.

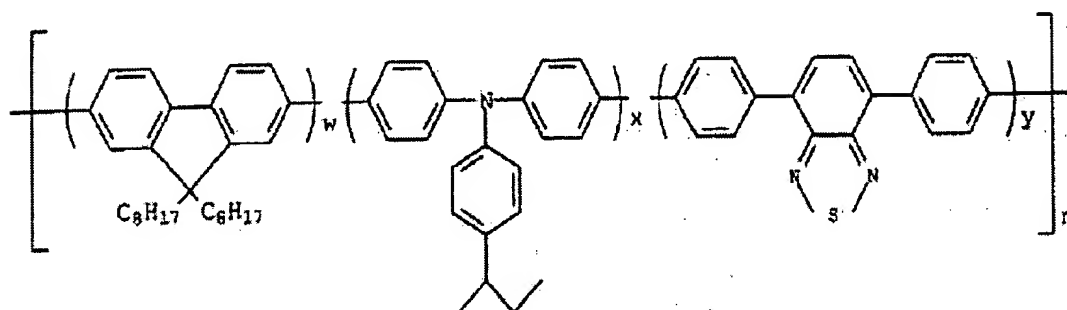
102. An organic polymer according to claim 1 and comprising all three regions, and having a formula as shown in Formula XXVIII:



XXVIII

wherein $w + x + y + z = 1$, $w \geq 0.5$, $0 \leq x + y + z \leq 0.5$ and $n \geq z$.

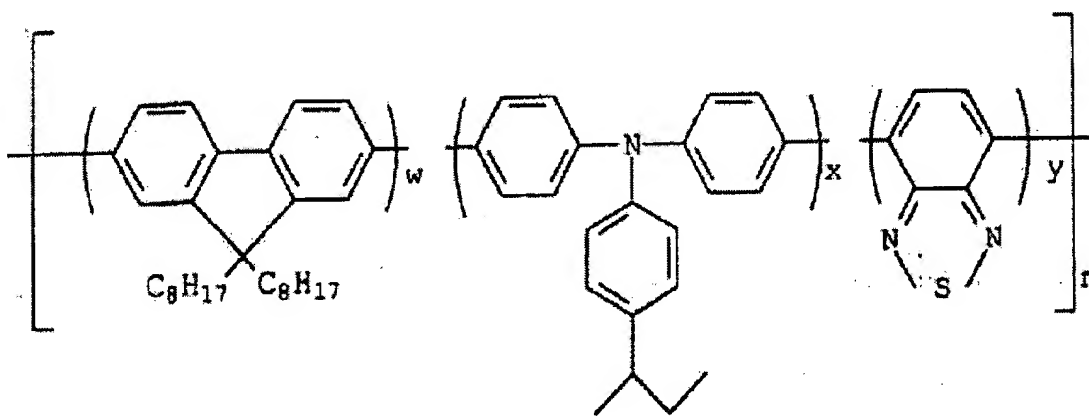
103. An organic polymer according to claim 1 and comprising all three regions and having a formula as shown in Formula XXIX:



(XXIX)

wherein $w + x + y = 1$, $w \geq 0.5$, $0 \leq x + y \leq 0.5$ and $n \geq 2$.

104. An organic polymer according to claim 1 and comprising all three regions and having a formula as shown in Formula XXX:

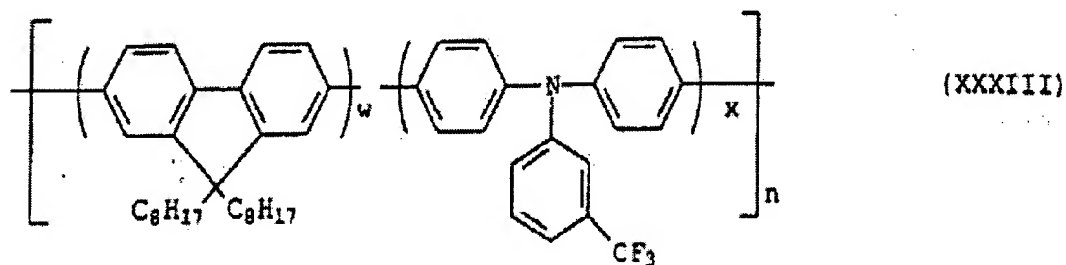
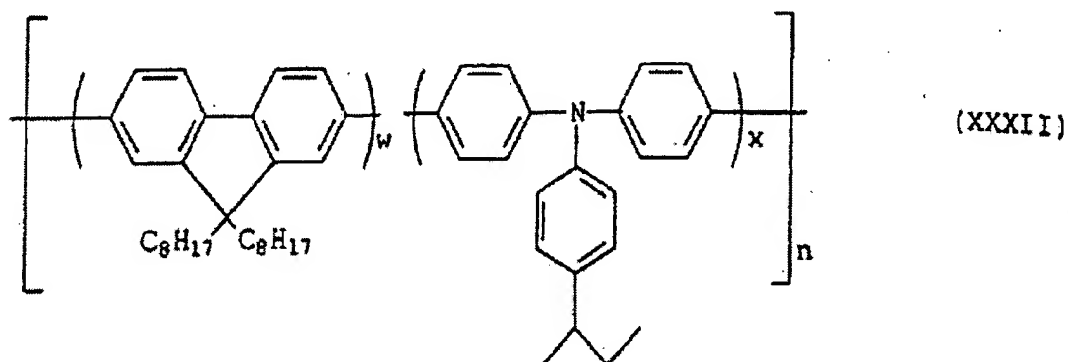


(XXX)

wherein $w + x + y = 1$, $w \geq 0.5$, $0 \leq x + y \leq 0.5$ and $n \geq 2$.

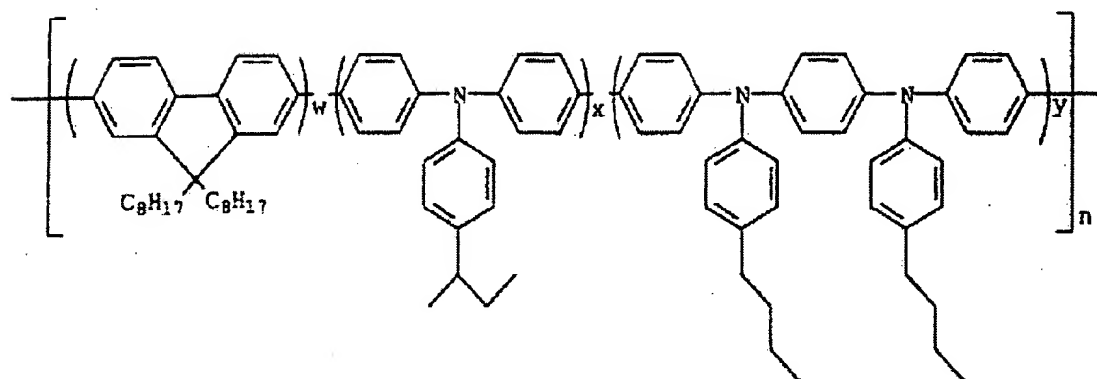
105. An organic polymer according to claim 1, and comprising the first and second regions.

106. An organic polymer according to claim 105, having a formula as shown in Formula XXXII or XXXIII:



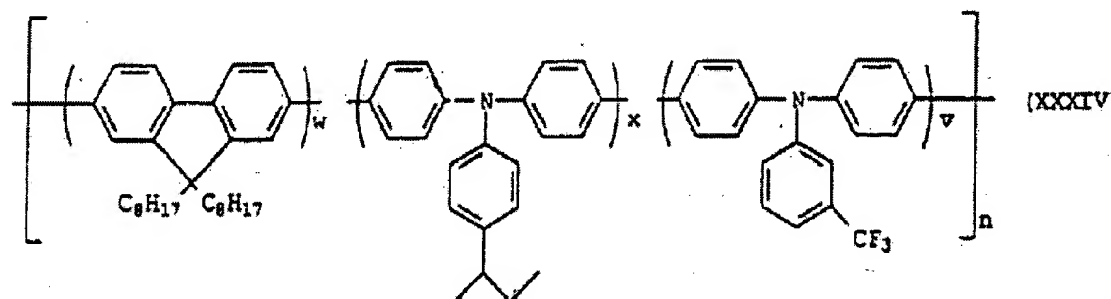
wherein $w + x = 1$, $w \geq 0.5$, $x \leq 0.5$ and $n \geq 2$.

107. An organic polymer according to claim 106, having a formula as shown in Formula XXXI:



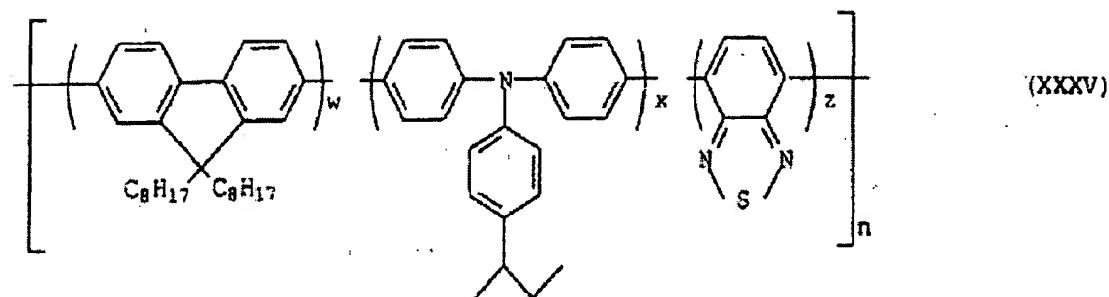
wherein $w + x + y = 1$, $w \geq 0.5$, $0 \leq x + y \leq 0.5$ and $n \geq 2$.

108. An organic polymer according to claim 105, having a formula as shown in Formula XXXIV:



wherein $w + x + v = 1$, $w \geq 0.5$, $0 \leq x + v \leq 0.5$ and $n \geq 2$.

109. An organic polymer according to claim 105, having a formula as shown in Formula XXXV:



wherein $w + x + z = 1$, $w \geq 0.5$, $0 \leq x + z \leq 0.5$ and $n \geq 2$.

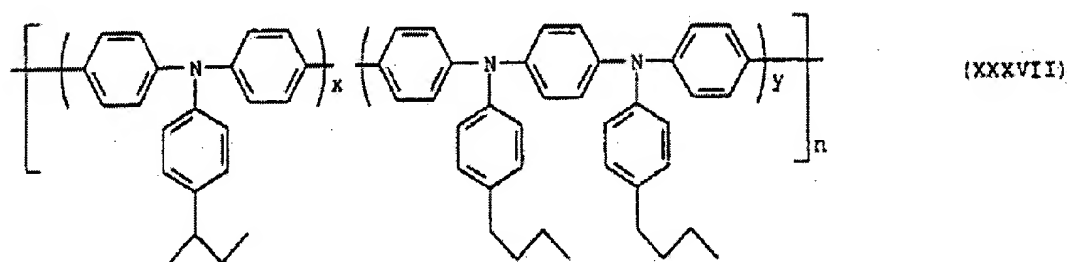
110. An organic polymer according to claim 105 which is blended with a light emissive material.

111. An organic polymer according to claim 1 and comprising the first and third regions, and blended with a hole transporting material.

112. An organic polymer according to claim 111, wherein the hole transporting material comprises a poly-triarylamine.

113. An organic polymer according to claim 1 and comprising the second and third regions.

114. An organic polymer according to claim 113, having a formula as shown in Formula XXXVII:



wherein $x + y = 1$, $x \geq 0.5$ and $y \leq 0.5$ and $n \geq 2$.

115. An organic polymer according to claim 113 which is blended with an electron transporting material.

116. An organic polymer according to claim 115, wherein the electron transporting material comprises poly-fluorene.

117. An electroluminescent device comprising an anode layer, a cathode layer, and a layer of an organic polymer situated between the anode layer and the cathode layer, the organic polymer having a plurality of regions along the length of the polymer backbone and comprising two or more of the following:

(i) a first region for transporting negative charge carriers and having a first bandgap defined by a first LUMO level and a first HOMO level; and

(ii) a second region for transporting positive charge carriers and having a second bandgap defined by a second LUMO level and a second HOMO level; and

(iii) a third region for accepting and combining positive and negative charge carriers to generate light and having a third bandgap defined by a third LUMO level and a third HOMO level, wherein each region comprises one or more monomers and the quantity and arrangement of the monomers in the organic polymer is selected so that the first, second and third bandgaps are distinct from one another in the polymer, and wherein the device includes an emissive material which may or may not be the third region, and the first LUMO level lies between a work function of the cathode and a LUMO level of the emissive material or which is matched to the LUMO level of the emissive material, and the second HOMO level lies between a work function of the anode

and a HOMO level of the emissive material or which is matched to the HOMO level of the emissive material.